

The differential response of transpiration and bare-soil evaporation to precipitation in a Chihuahuan Desert shrubland

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Goals of the study



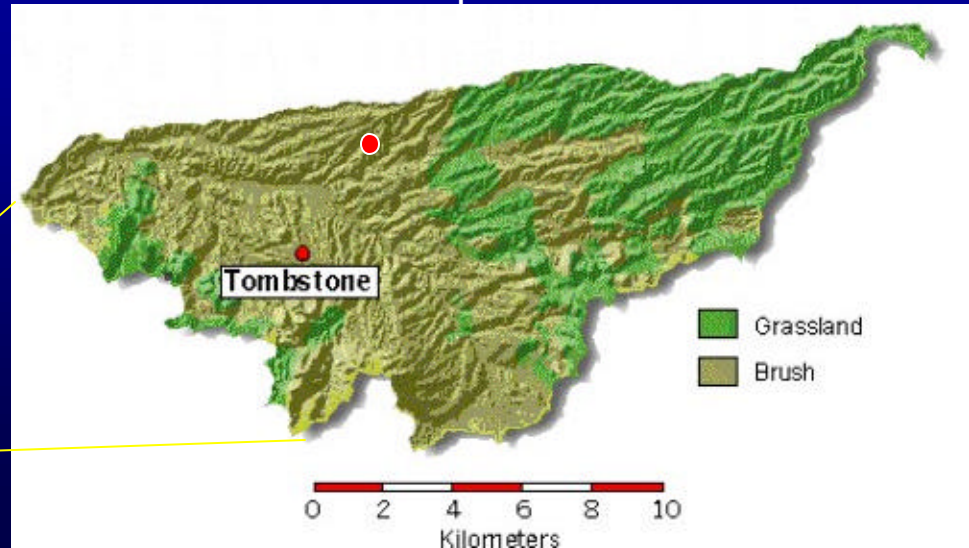
Determine the partitioning of ET during the summer rainy season

Quantify the response of E and T to precipitation and soil moisture

Determine how E and T are related to ecosystem carbon dioxide exchange

Background

USDA-ARS Walnut Gulch Experimental Watershed



How does the partitioning of ET in an ecosystem influence the carbon balance?

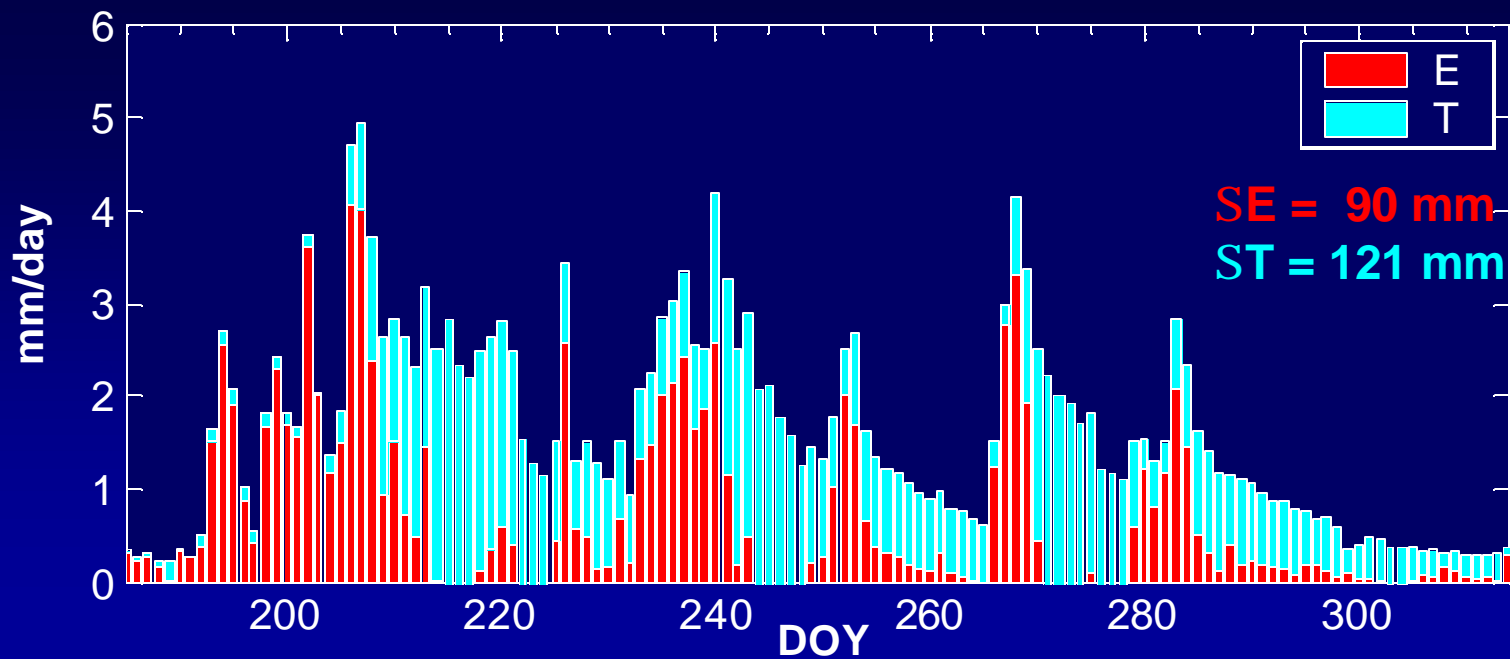
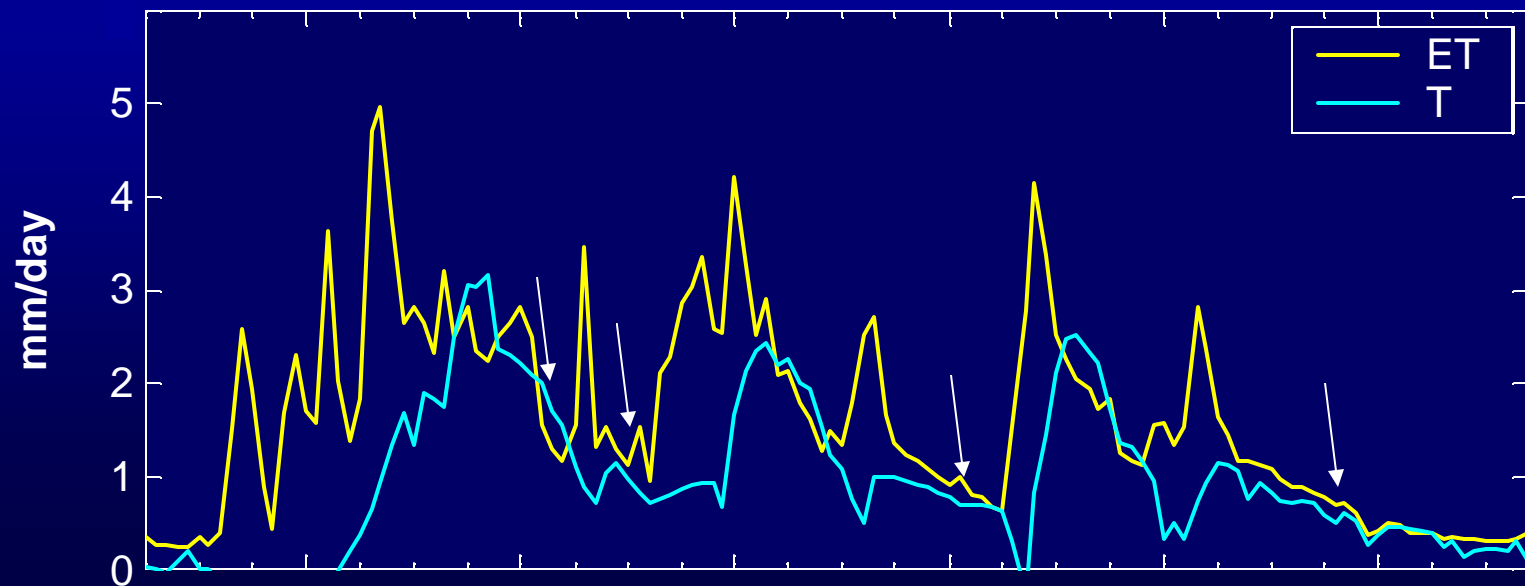
Methods



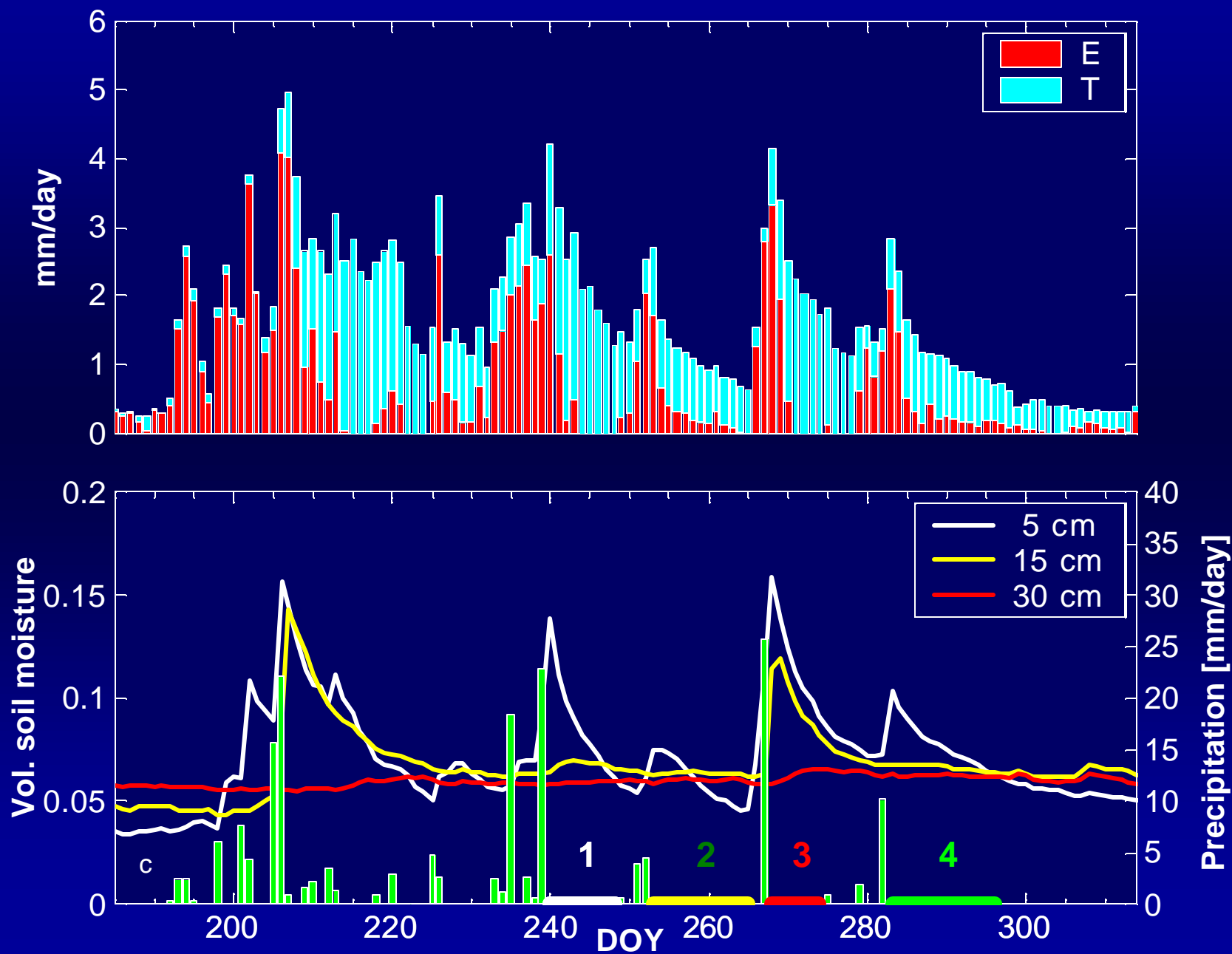
In a Chihuahuan Desert shrubland during the summer monsoon:

- Determine ET via micrometeorological methods
- Determine shrub transpiration/sap flow using heat balance method and scale to ecosystem-level using stem survey

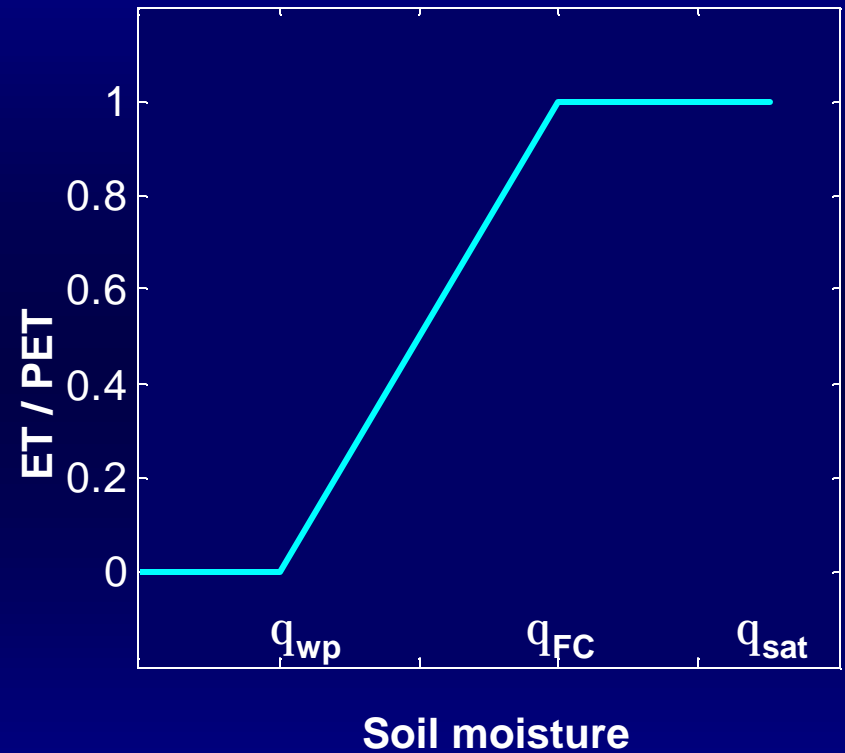
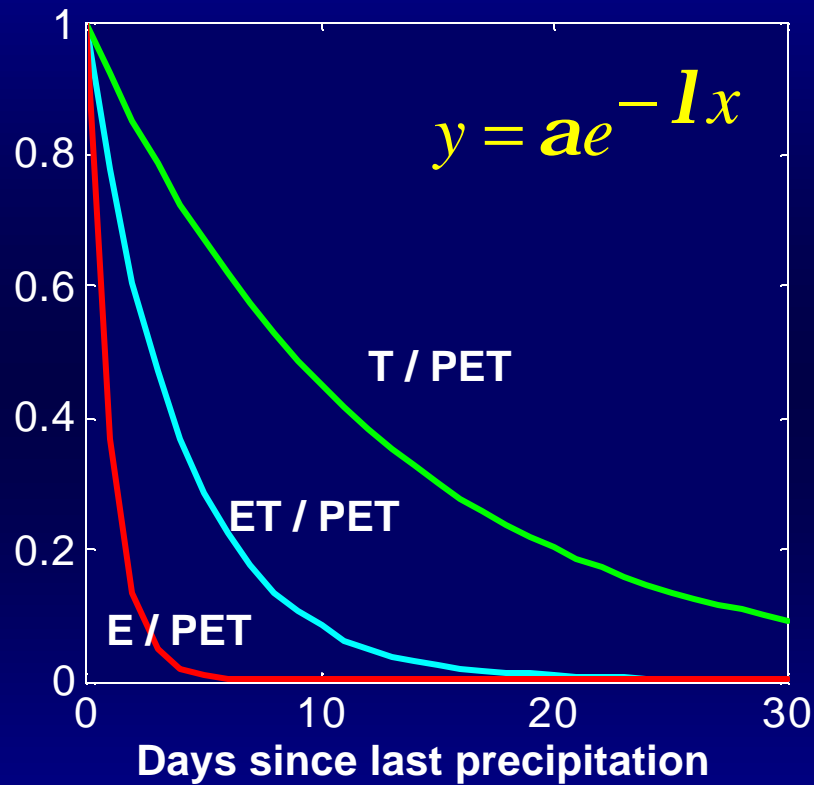
ET partitioning



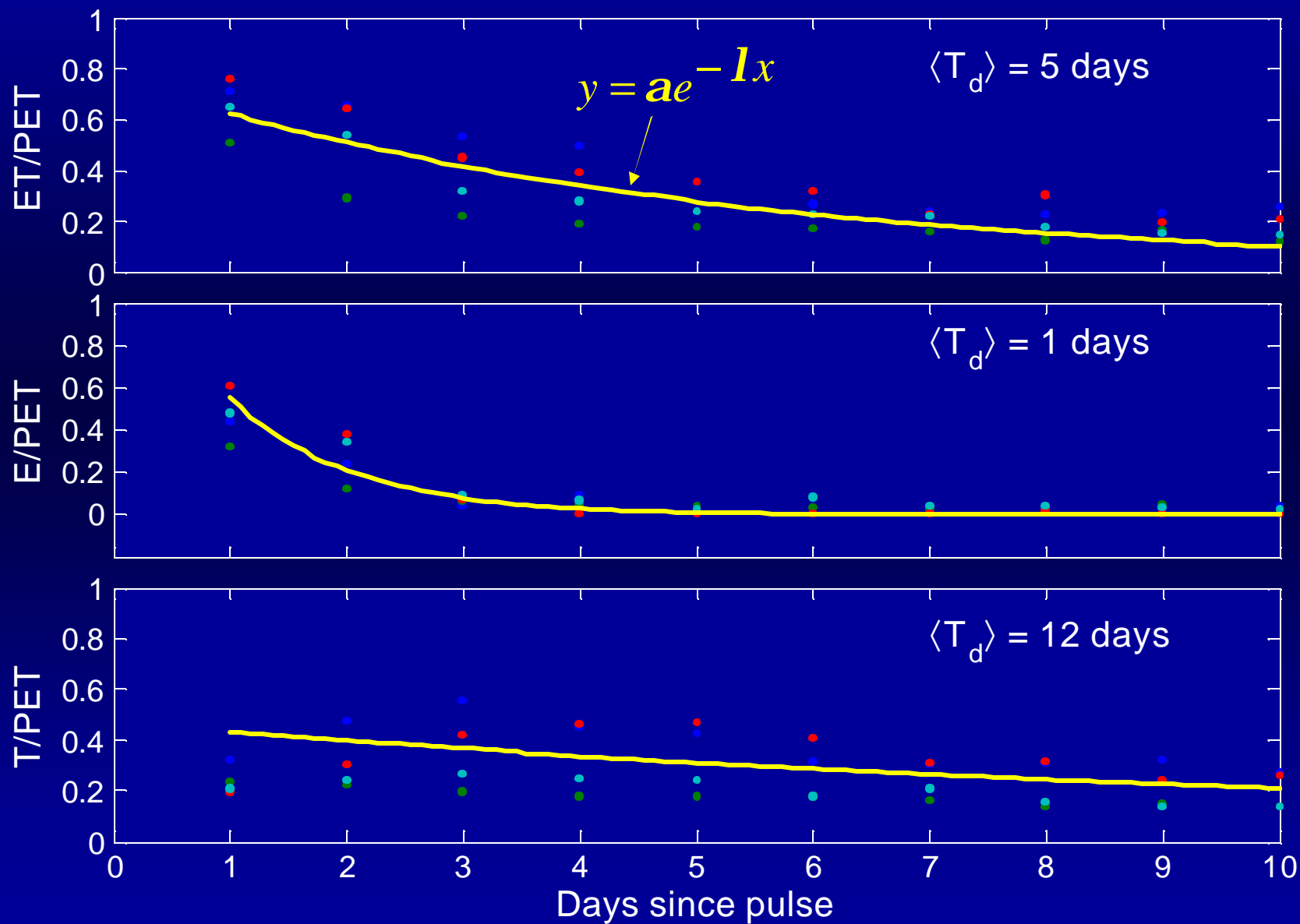
E, T, soil moisture, and precipitation



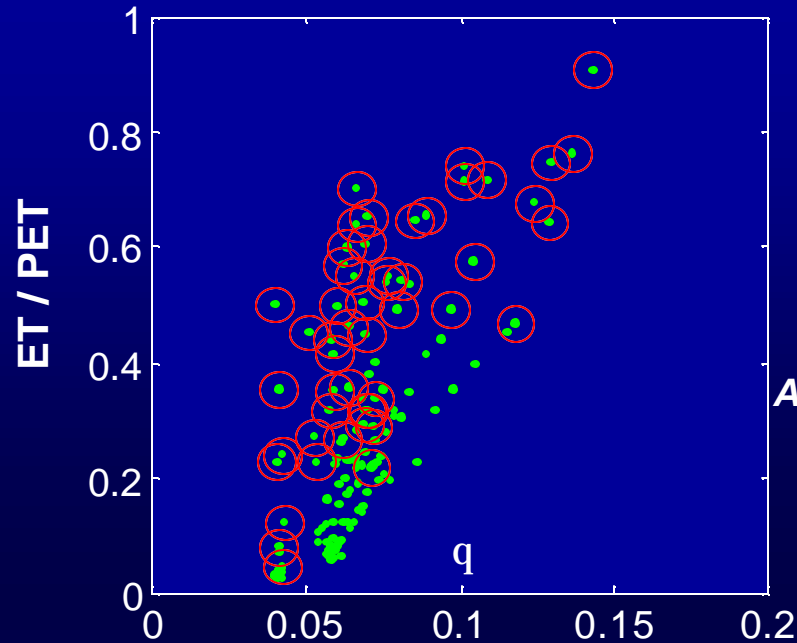
E and T timescales and response to soil moisture



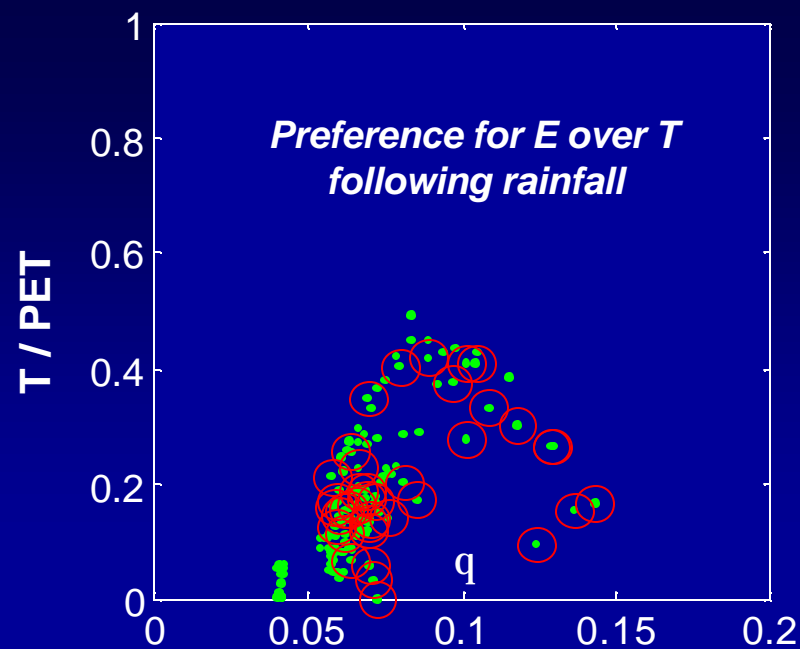
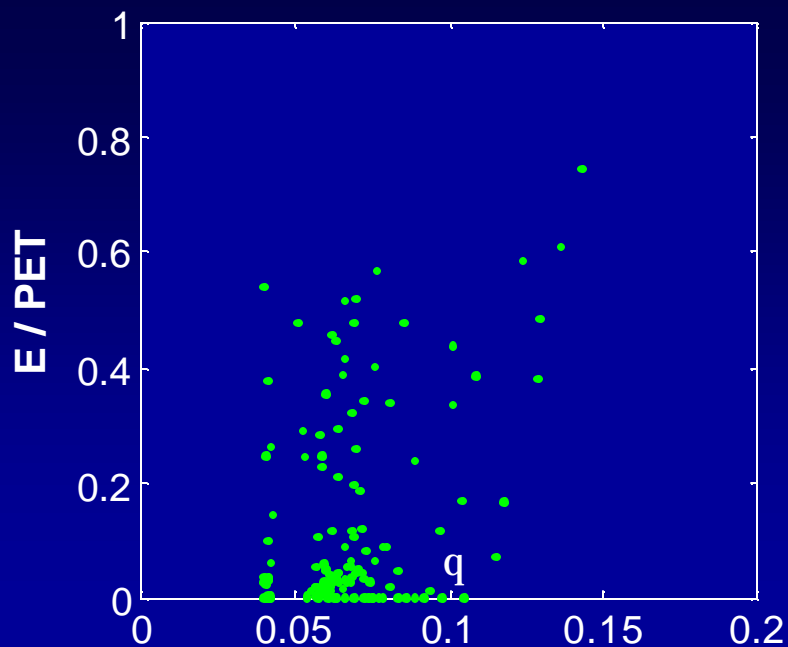
ET timescales



ET vs. 2.5 – 17.5 cm soil moisture

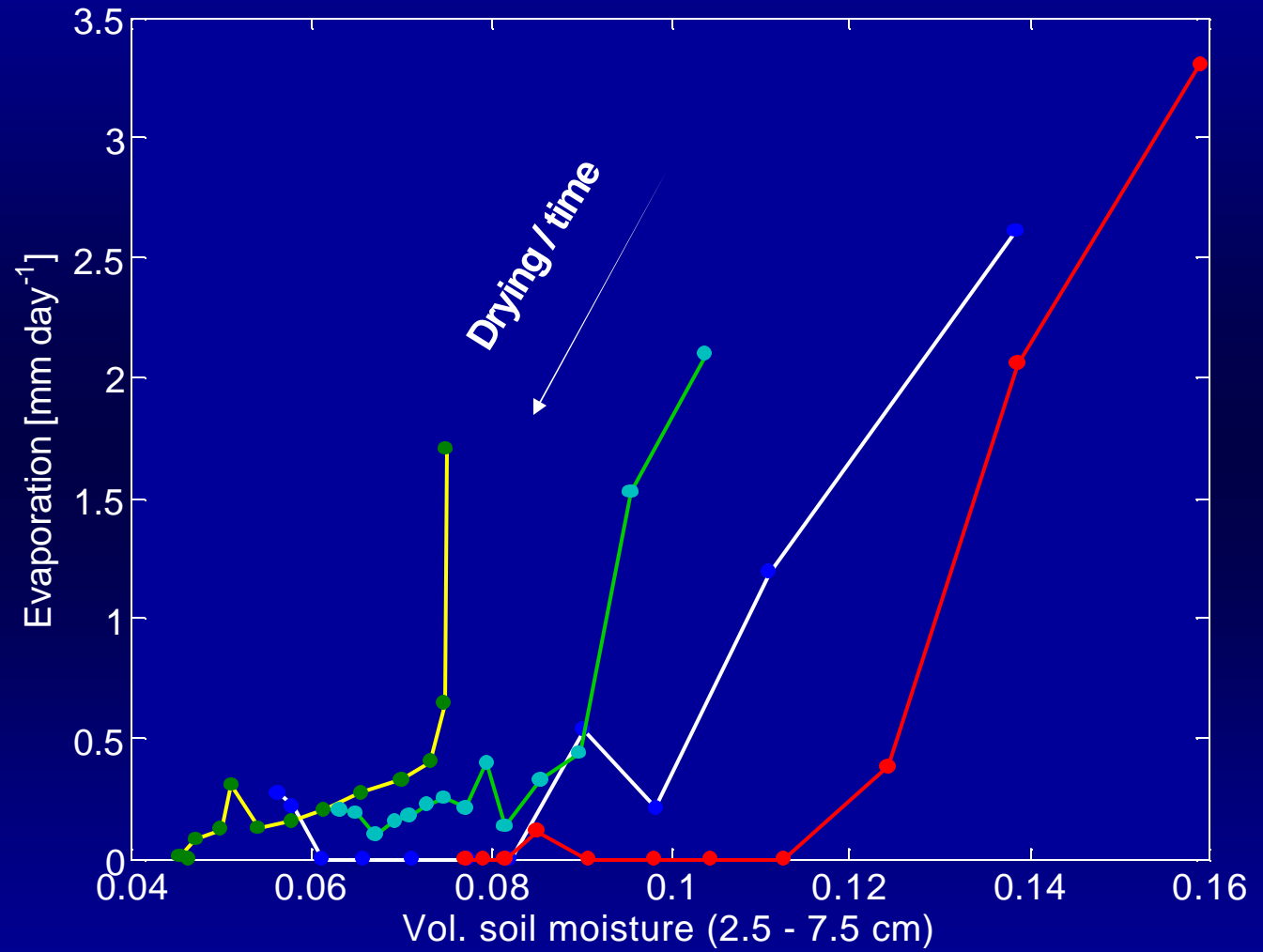


*Atmospheric demand
Is rarely satisfied*

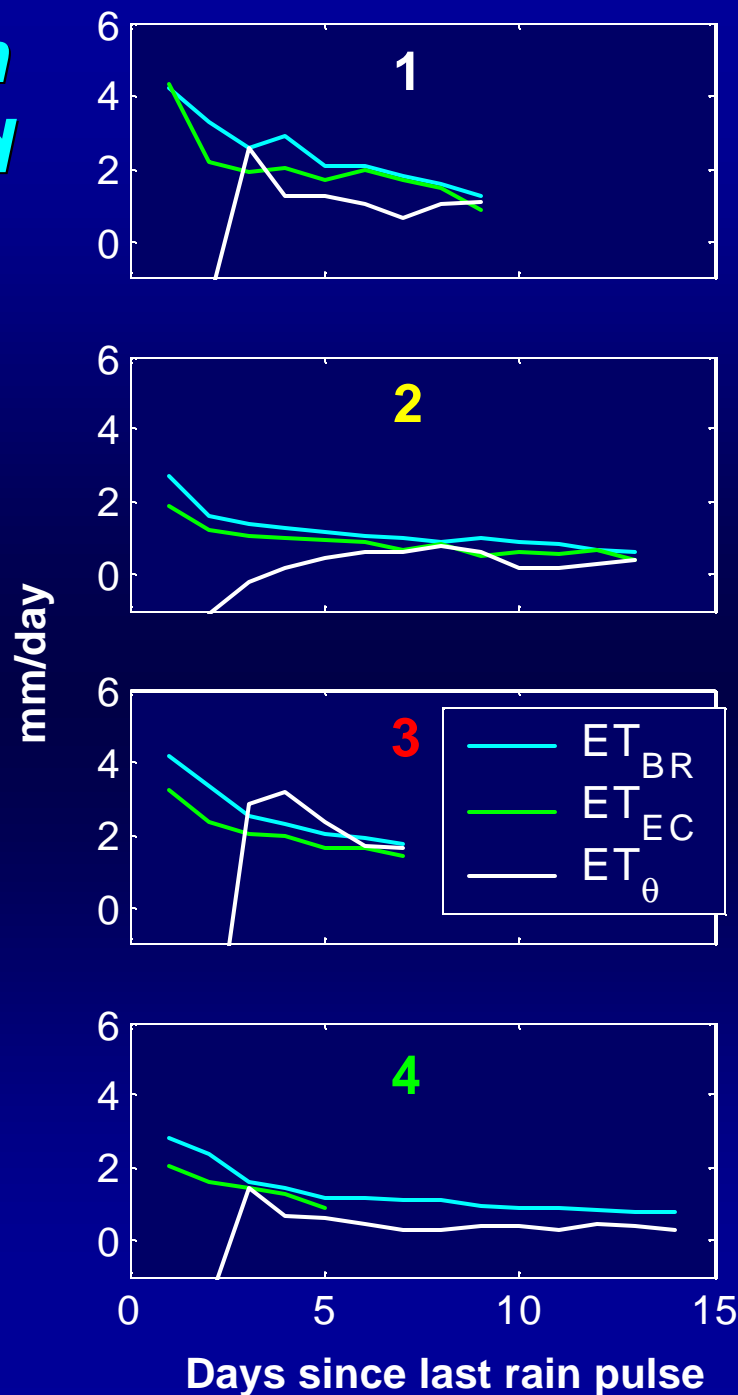
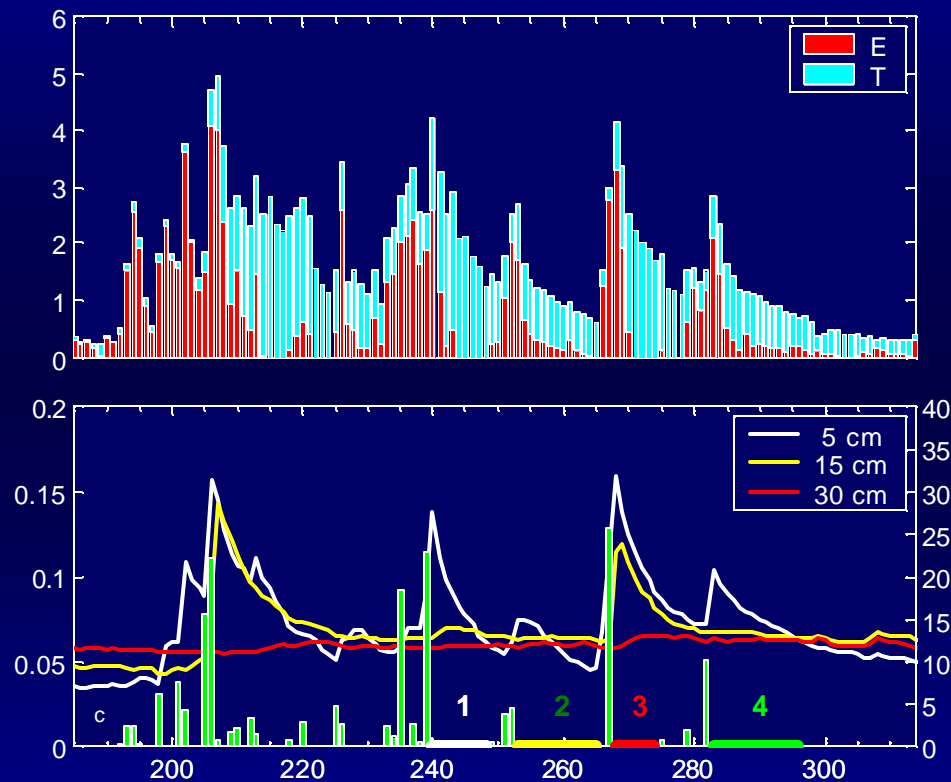


*Preference for E over T
following rainfall*

Evaporation and shallow soil moisture

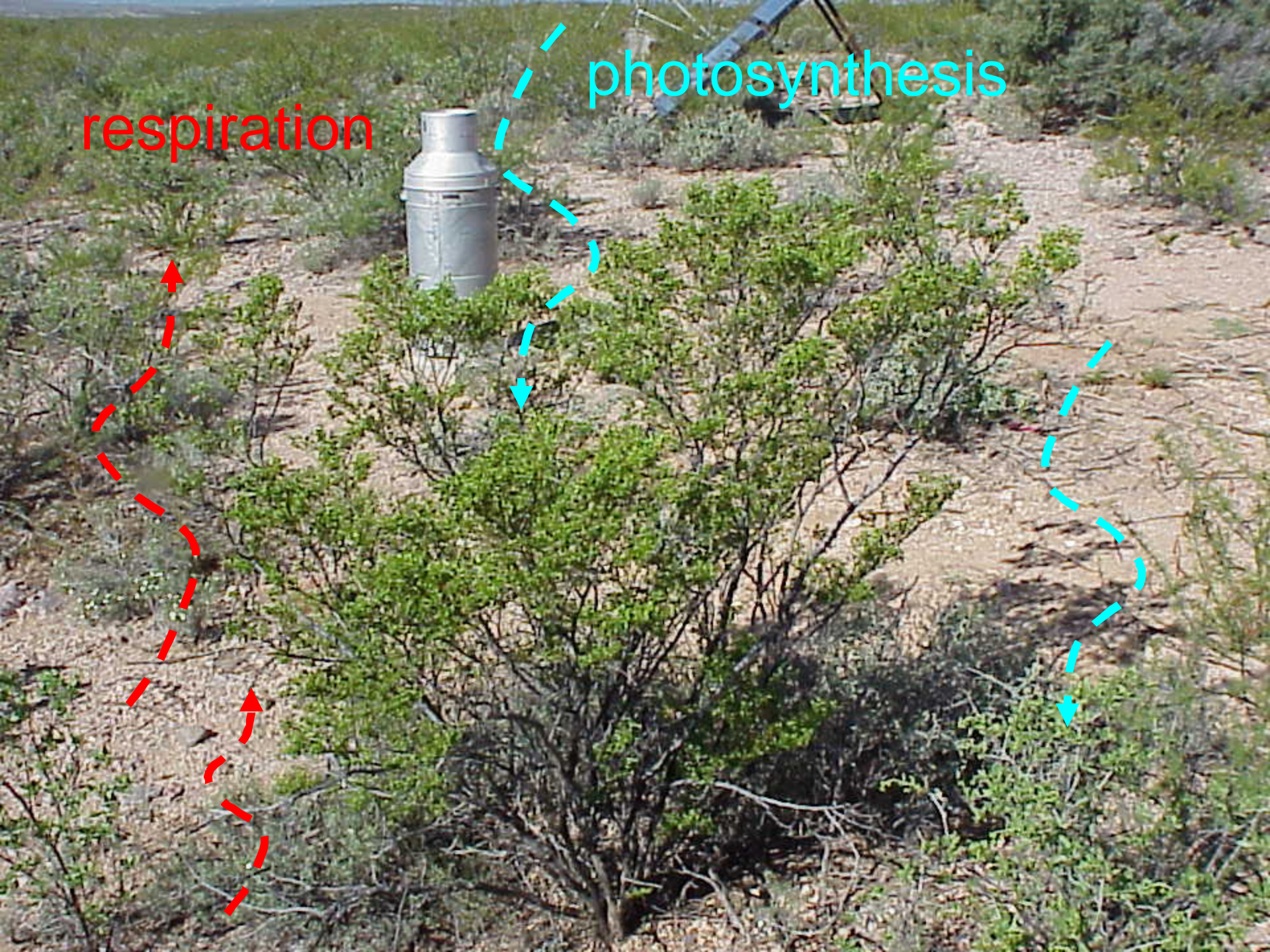


Comparing *ET* from Bowen ratio, eddy covariance, and soil water changes

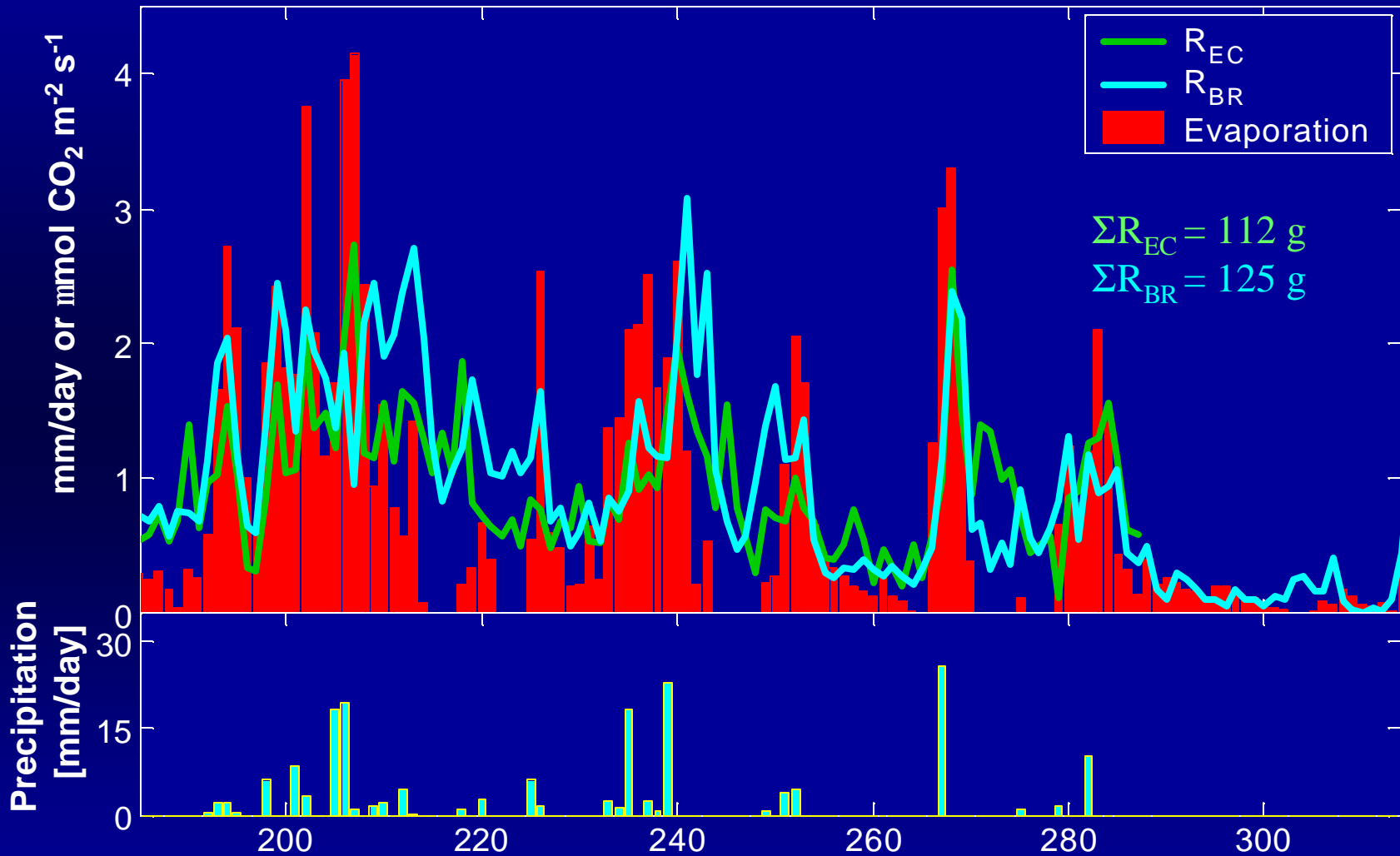


respiration

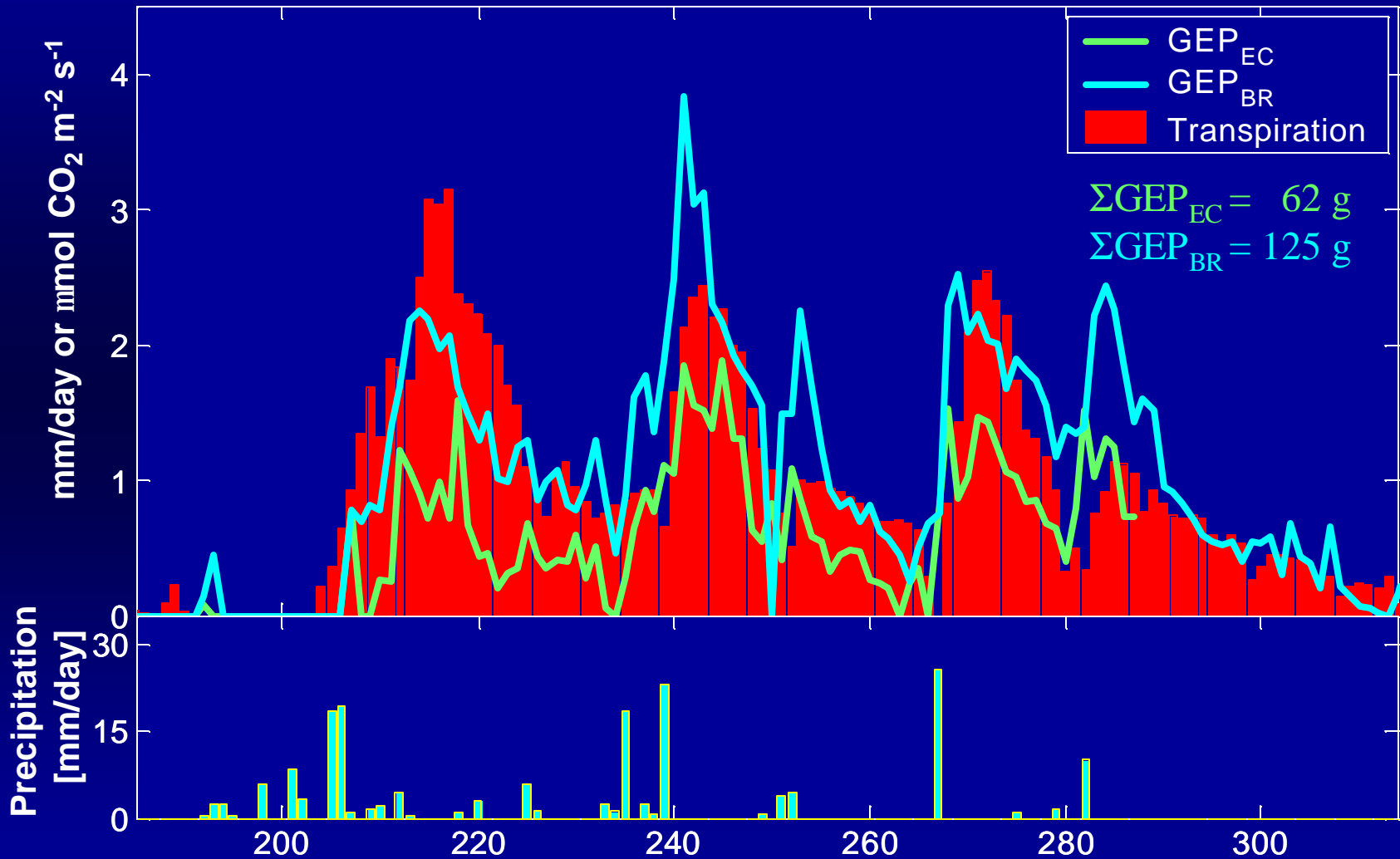
photosynthesis



Evaporation and respiration



Photosynthesis and transpiration



Summary: ET partitioning in a semiarid shrubland

Nearly 45% of the available moisture was lost via bare-soil evaporation.

The timescales of the ET response was composed of very rapid (E) and slower (T) response.

There was a preferential response to evaporation over transpiration following rain events.

E is poorly predicted by a soil moisture measurement at 5 cm. T was responsive to soil moisture at 2.5 – 17.5 cm.

E and T were closely related to ecosystem carbon loss and uptake.

Substantial differences were found between Bowen ratio and eddy covariance water and carbon fluxes.

